

European Geophysical Society
April 21-26, 2002
Nice, France

CLOUD THICKNESS FROM OFFBEAM RETURNS - THOR LIDAR

R. Cahalan, J. Kolasinski and M. McGill

NASA/Goddard, Laboratory for Atmospheres

Physical thickness of a cloud layer, and sometimes multiple cloud layers, can be estimated from the time delay of off-beam returns from a pulsed laser source illuminating one side of the cloud layer. In particular, the time delay of light returning from the outer diffuse halo of light surrounding the beam entry point, relative to the time delay at beam center, determines the cloud physical thickness. The delay combined with the pulse stretch gives the optical thickness. The halo method works best for thick cloud layers, typically optical thickness exceeding 2, and thus compliments conventional lidar, which cannot penetrate thick clouds. Cloud layer top and base have been measured independently over the ARM/SGP site using conventional laser ranging (lidar) and the top minus base thickness are compared with a cloud top halo estimate obtained from the NASA/Goddard THOR System (THOR = THickness from Offbeam Returns). THOR flies on the NASA P3, and measures the halo timings from several km above cloud top, at the same time providing conventional lidar cloud top height. The ARM/SGP micropulse lidar provides cloud base height for validation.